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[54] **NON-HAZARDOUS THIRD RAIL ENERGIZING WARNING DEVICE**

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[51] **Int. Cl.**[6] **G08B 21/00**

[52] **U.S. Cl.** ..... **246/1 C**; 246/217; 246/473 R; 340/660

[58] **Field of Search** ..... 246/217, 473 R, 246/477, 478, 484, 488, 167 A, 1 C; 324/555, 556; 340/309.15, 309.6, 653, 654, 815.4, 815.43, 815.65, 384.1, 384.4, 654, 660, 649, 628, 657

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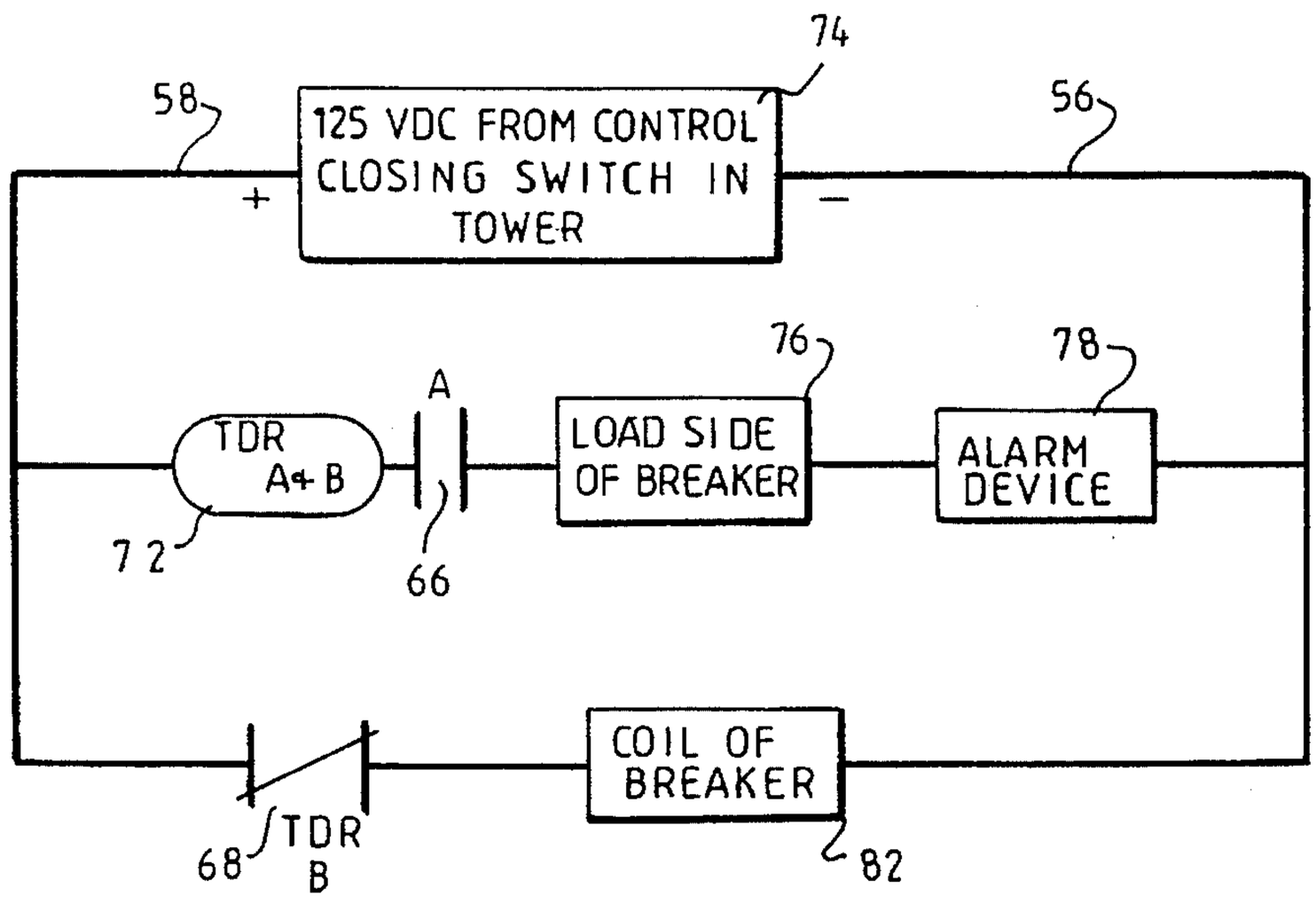
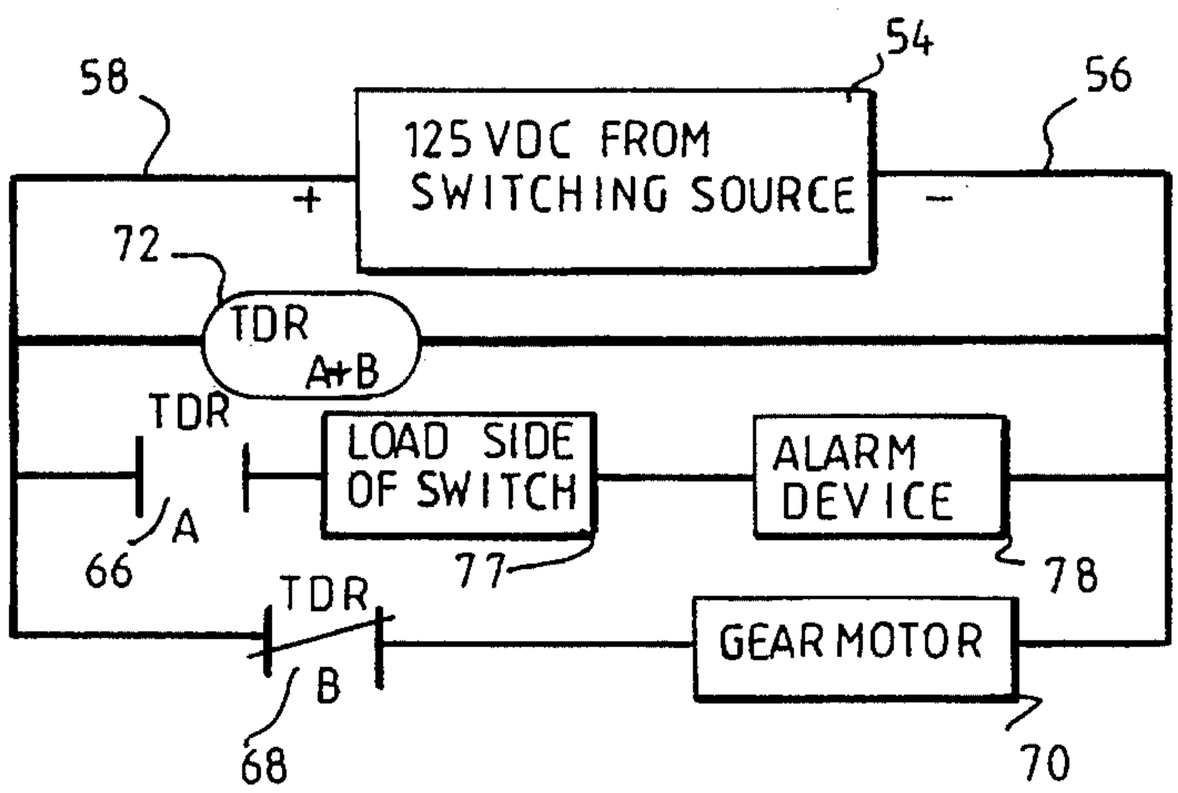
[57] **ABSTRACT**

A third rail warning device in which the third rail carries in use a dangerously high voltage. Connected to the third rail is a source of relatively safe voltage as a warning that the dangerously high voltage is about to be applied to the third rail. A time delay is employed to terminate the safe voltage and permit automatic connection of the dangerously high voltage, and an alarm is actuated when the safe voltage is being applied to the third rail.

1 Claim, 2 Drawing Sheets





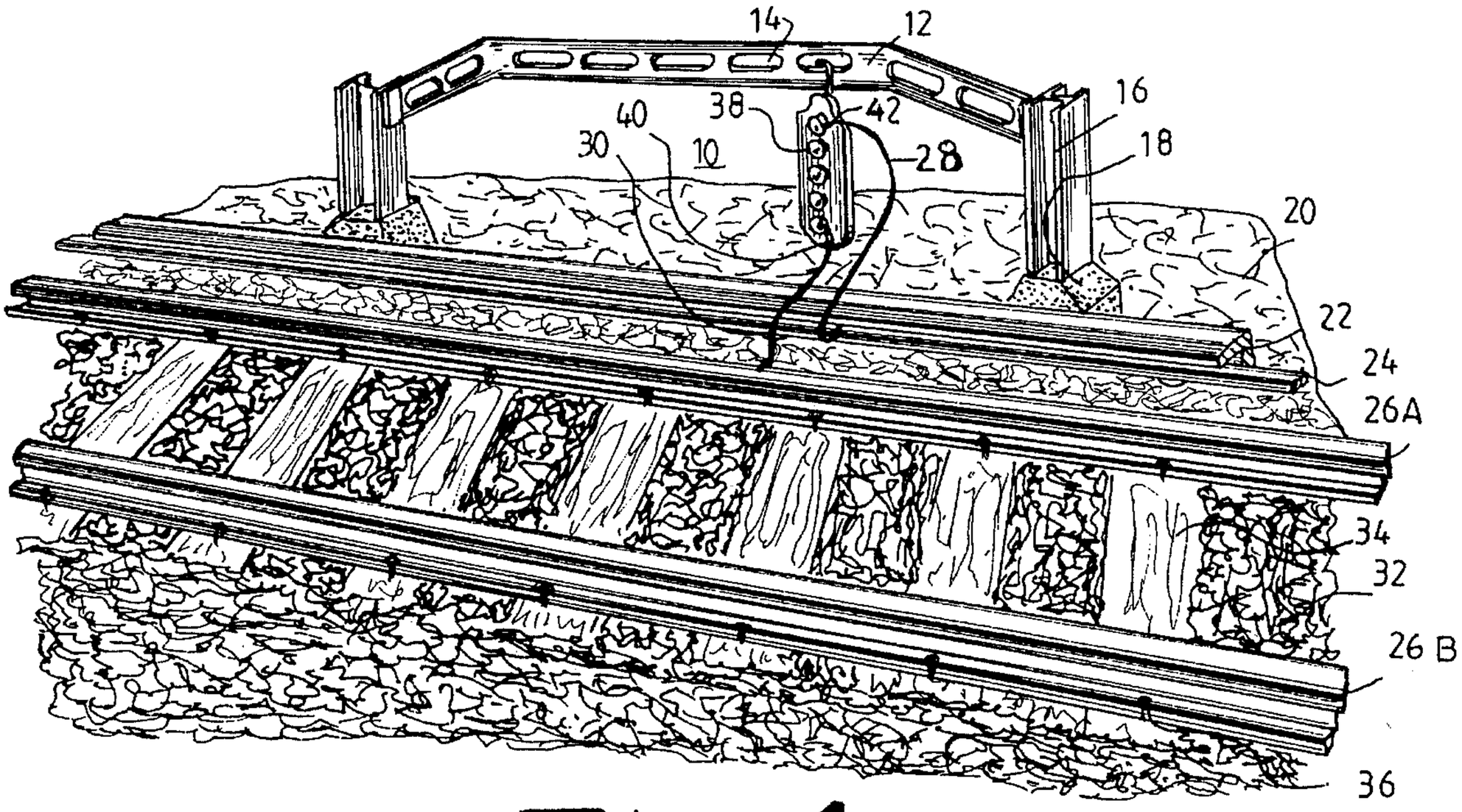


Fig. 1
(PRIOR ART)

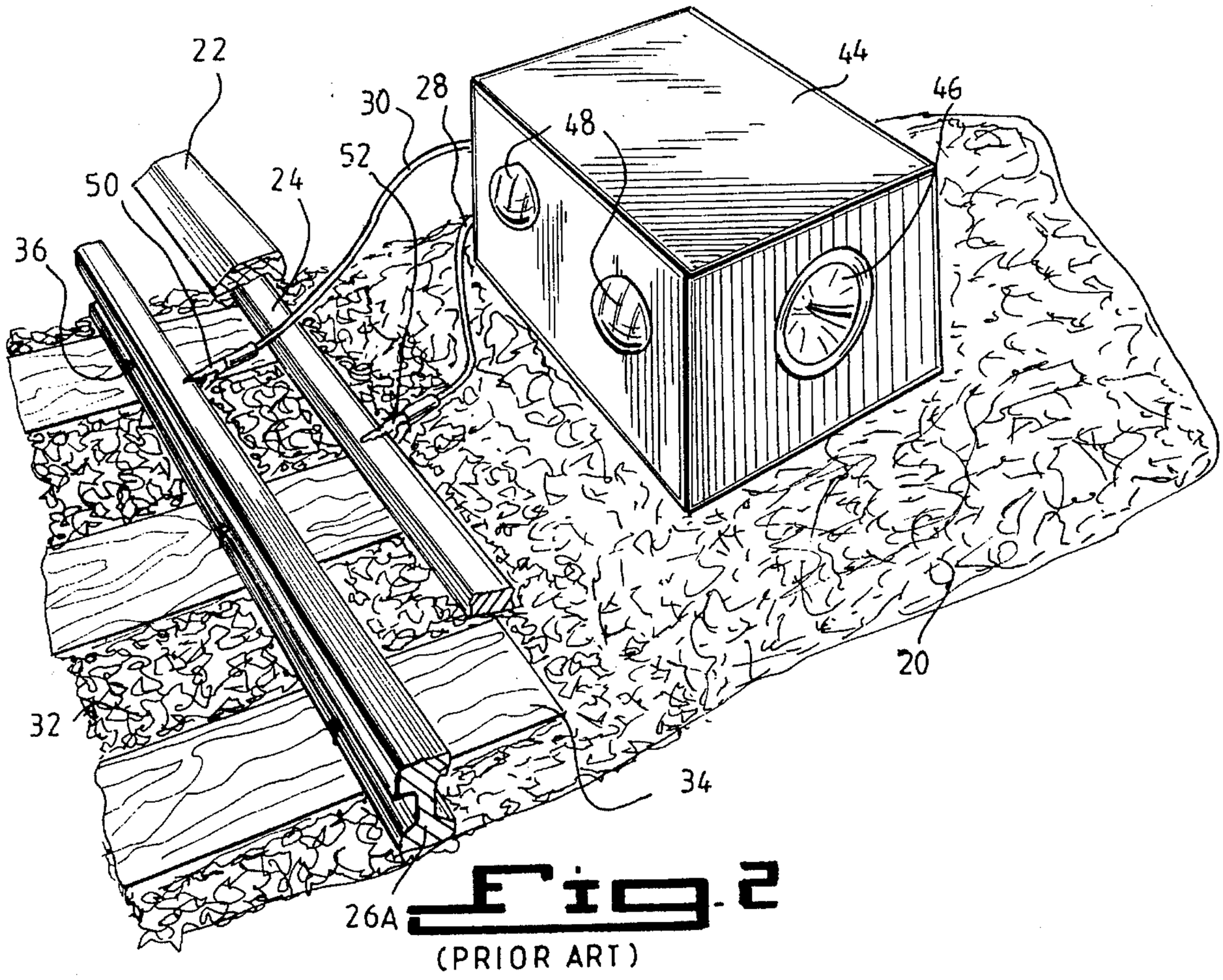


Fig. 2
(PRIOR ART)

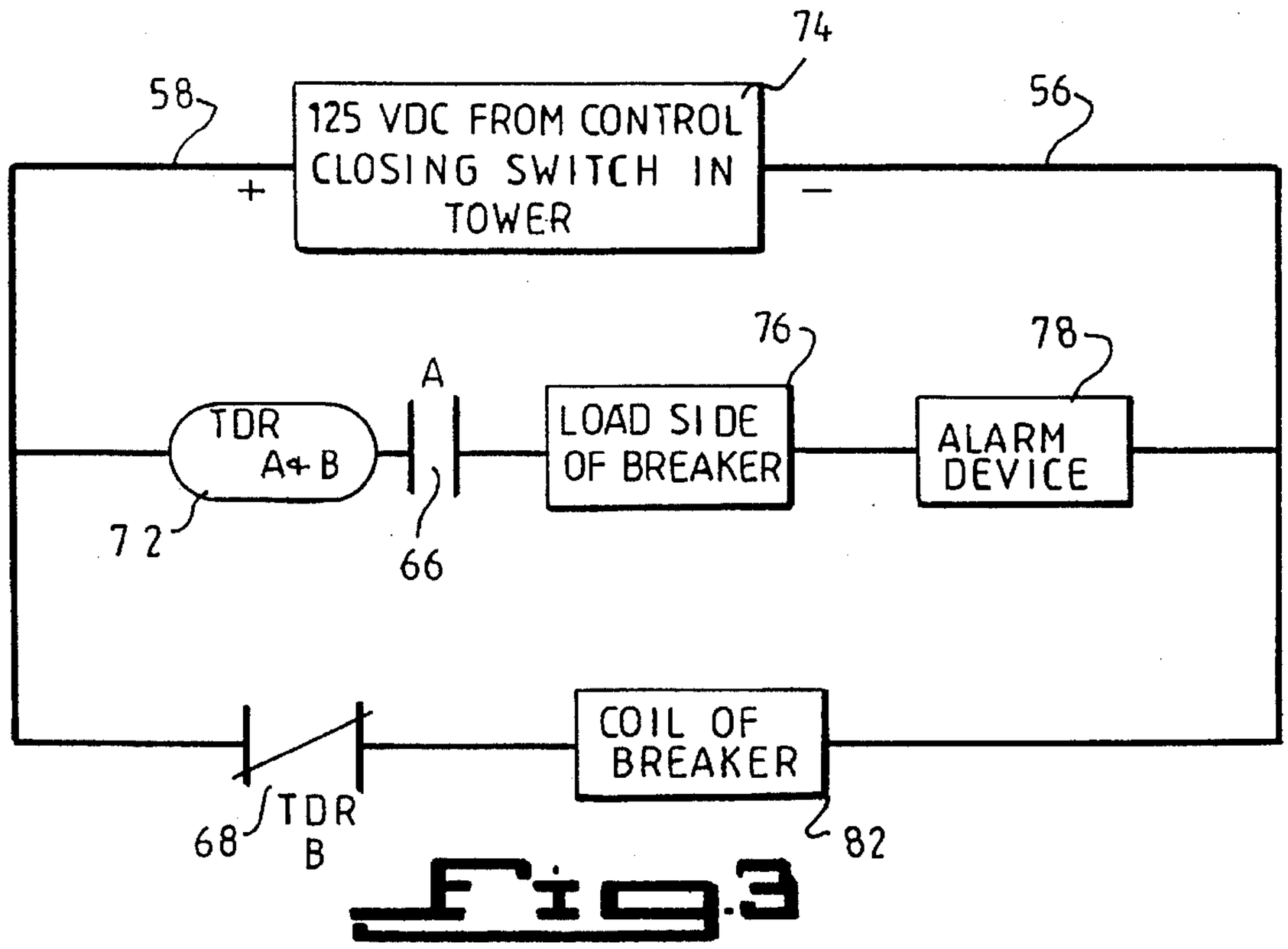


Fig.3

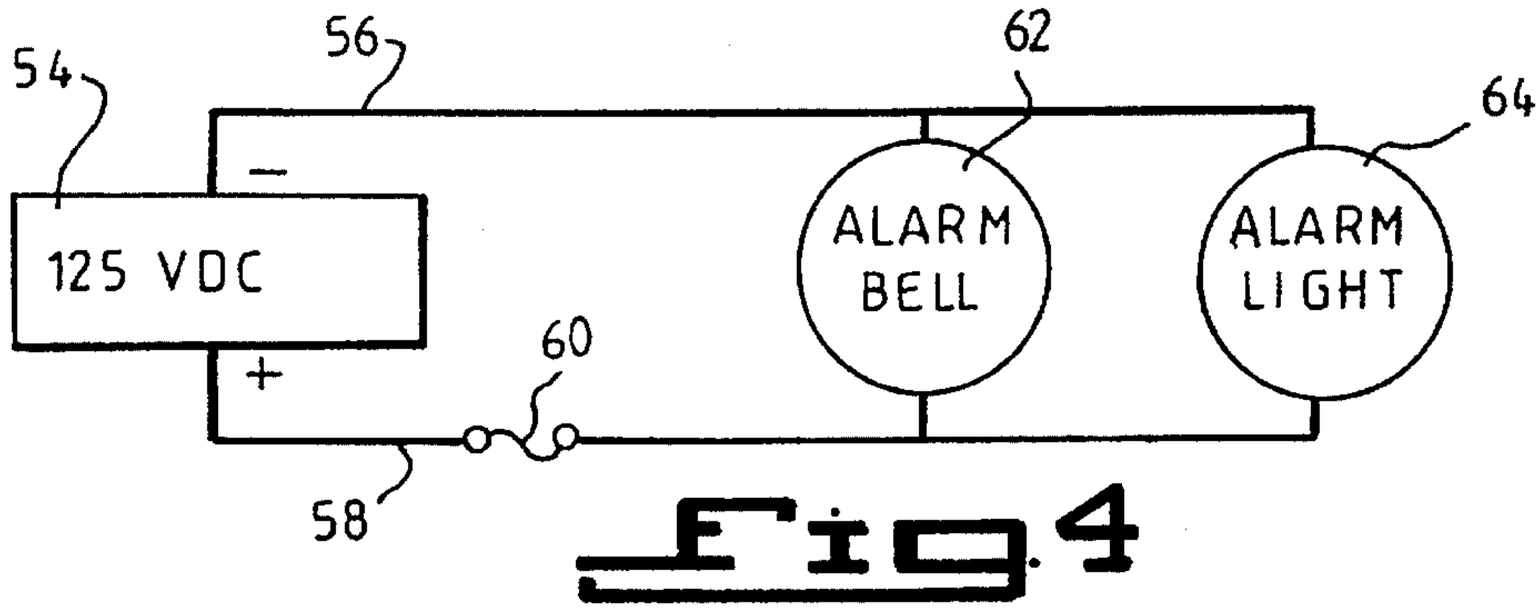


Fig.4

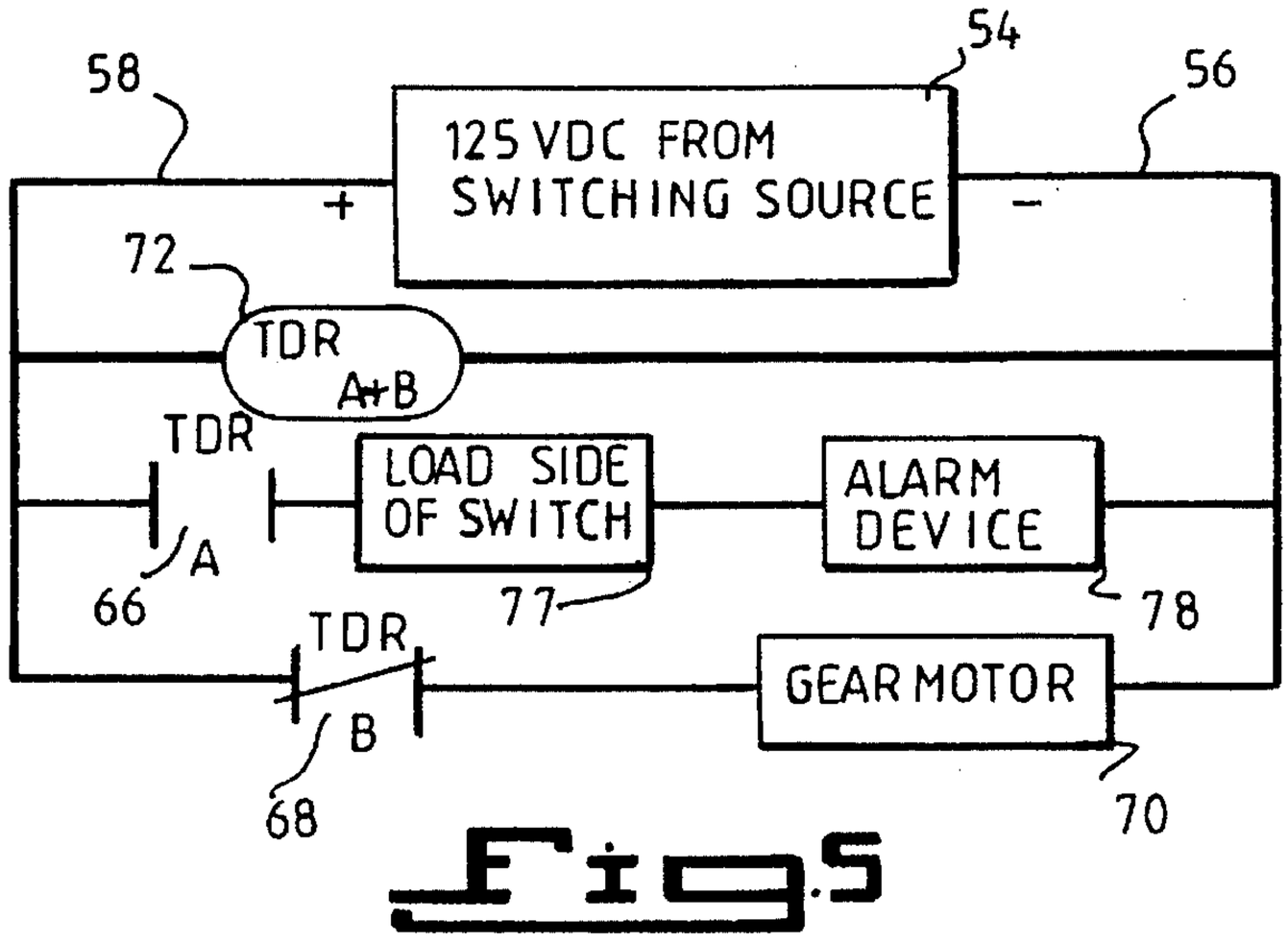


Fig.5

NON-HAZARDOUS THIRD RAIL ENERGIZING WARNING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to audio and visual warning and alarm systems and particularly to warning and alarm systems adapted to communicate prior to when a dangerous voltage is present on the third rail of a transit or railroad system.

2. Description of the Prior Art

The intent of this invention is to provide personnel with a non-hazardous warning system prior to third rail energization with 625 volts D.C.

Currently there exist two indication methods of third rail energization which are hazardous to personnel working on tracks. These two methods can be used separately or in conjunction with each other. The first method being a bank light device, hence its name Bank Light Device. This device consists of a set of five 125 volt incandescent bulbs that are wired in series and connected to the third rail by means of alligator clips. The second warning method is an audio-visual device. This device is also activated by a 625 volt D.C. and is connected in the same fashion as the bank light device. In both cases a dangerously high voltage is required to activate these indication devices. There is no prior warning of 625 volt D.C. energization to track personnel.

The typical transit system will have two running rails on which the wheels of the cars roll and a third rail which carries the electric power for the electric motors used to drive the transit cars. This voltage which may typically be 600 volts D.C., although specific systems may have substantially different voltages. The maintenance crews performing work in the vicinity of third rails must have the power turned off on the third rail to avoid an intolerably dangerous working condition. The power to the third rail is typically turned on and off from a remote panel which is not visible to the maintenance crew working near or on the rails.

Maintenance crews have previously relied on make-shift means for determining if a voltage is present on the third rail. These make-shift means have included the use of five conventional incandescent lamps connected in a series. This approach has been unsatisfactory because a single failure of any one of the lamps produced a visual signal which was identical to the signal when no voltage was present. More specifically, although an illuminated string of incandescent lamps connected between one running rail and the third rail indicates electrical power is present, an unlighted string of lamps indicates; (1) no voltage is present or (2) that one or more of the lamps has a burned out filament or (3) there is a bad connection to one of the rails.

A hazard involved in using such apparatus is that the user typically must approach rather closely to the third rail which may be at a relatively high voltage. The high voltage is sufficiently dangerous so that even a slight brush against the third rail may be fatal.

Other problems with these approaches include (1) the test is only a valid test at the instant at which the test is being conducted. In other words, the test is not a continuing test which would produce a very positive signal for the maintenance crew immediately upon turning on power to the third rail. The test can be completed in one instant and an instant later the power can be turned back on and there will be no indication of the power being turned on to warn the

maintenance worker that a dangerous voltage level is present on the third rail. Particularly with the light bulb approach, the warning signal is merely a visual signal. It is a continuous test but has two problems: a) bank lights, mainly bulbs, going dead; and b) 625 V D.C. activated (Prior Art FIGS. 1 and 2).

Numerous innovations for third rail warning systems have been provided in the prior art that are adapted to be used. Even though these innovations may be suitable for the specific individual purposes to which they address, they would not be suitable for the purposes of the present invention as heretofore described.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a third rail warning device.

More particularly, it is an object of the present invention to provide a third rail warning device which avoids the disadvantages of the prior art.

In one form of the invention the apparatus includes means in the means for indicating which allows the connection of one positive lead to the third rail and the negative lead to one of the other rails which act as a ground.

The object of this invention idea is to provide personnel a warning system activated prior to 625 volt D.C. third rail energization.

It is the intent to accomplish this inventive idea through modification of existing 125 volt D.C. closing coil control circuit, using this less hazardous voltage to activate third rail warning systems.

It is an object of the invention to provide a signalling device for signaling the presence of power on the third rail of a transit system which will provide both an audible and a visual signal indicating the presence of electrical power on the third rail.

It is another object of the invention to provide an apparatus which will perform a continuing test to indicate the presence of power on the third rail.

Still another object of the invention is to provide an apparatus which will function with a wide range of voltages on the third rail.

Another object of the invention is to provide apparatus which is adjustable to engage transit systems of various dimensions and manufacturing origin.

An additional object of the invention is to permit the low voltage apparatus to be used simultaneously while allowing the passage of maintenance vehicles including hand propelled vehicles on the running rails and thus minimize interference and personal hazard to and with maintenance operations which will frequently be conducted utilizing such vehicles.

It has now been found that these and other objects of the invention may be attained in apparatus for indicating the presence of power on the third rail of a transit system having two running rails and a third rail, which includes first means for connecting to the third rail, second means for connecting to one of the running rails and a low voltage generated means for indicating the presence of a voltage prior to and between the first means for connecting and the second means for connecting and thereby indicating a voltage between the one running rail and the third rail, the means for indicating including means for providing a visual and audio warning prior to the presence of a high voltage in a predefined range energizing the third rail.

In one type of embodiment of the invention includes a means for providing an audible indication is an annunciator and the means for providing a visual indication such as a strobe light.

The novel features which are considered characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of the specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a perspective view of a third rail voltage indicating means as previously described in prior art.

FIG. **2** is a perspective view of an audio and visual third rail warning device as previously described in the prior art.

FIG. **3** is an electrical schematic view of an alarm control panel for alarm signal prior to the breaker closing and energizing the third rail.

FIG. **4** is an electrical schematic view of an alarm device used in conjunction with a time delay relay alarm circuit 125 VDC from A contacts in the time delay relay of a control panel via the third rail.

FIG. **5** is an electrical schematic view of an alarm panel for sectionalizing switch.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, the third rail warning device **10** is electrically connected to the third rail **24** by a positive lead **28** and connected to the grounding rail **26***a* via a negative grounding lead **30**. At the terminus of the positive lead **28**, a positive lead coupler **42** attaches the positive lead **28** from the third rail **24** to the third rail warning device **10**. Concurrently, the negative lead **30** is electrically connected to the third rail warning device **10** via the negative lead coupler **40**. The third rail warning device **10** is movably connected to a cross member **12** by a hanger-type of mechanism which is inserted into the cross member opening **14**. The third rail **24** is covered by third rail cover **22** but this cover still permits contact of the third rail **24** by a human which presents a hazardous condition.

The cross member **12** is securely connected to a vertical strut **16** which is mounted into a vertical strut base **18**. In addition to the inner rail track **26***a* there exists an outer rail track **26***b*, both of which function as the support members upon which a train rides. The rail tracks are securely mounted on railroad ties **34** by railroad spikes **36**. The railroad ties **34** are positioned upon the gravel **32** which is surrounded and over soil **20**.

When the third rail **24** is energized with high voltage, the warning lights **38** which are mounted within the third rail warning device **10** illuminate. This depiction of a device only exhibits a direct linkage between the third rail **24**, inner rail track **26***a* and the third rail warning device **10**. Thus, there is not present in FIG. **1** a non-hazardous third rail warning device as described in the present invention. In FIG. **1**, when the third rail **24** is energized, simultaneously the third rail warning device **10** illuminates without prior warning to the high voltage energization.

Referring to FIG. **2**, another version of a prior art third rail warning device is exhibited which contains both audio **46** and visual **48** warning indicators. Both of the indicators are encased in a housing **44**. The positive lead **28** is directly connected to the third rail **24** by a positive lead alligator clip **52**. The negative lead **30** is directly connected to the inner rail track **26***a* by a negative lead alligator clip **50**.

This depiction of a prior art third rail warning system does not exhibit the novelty of the present invention. Thus, there is not present in FIG. **2** a non-hazardous third rail warning device as described in the present invention. Hence, when the third rail **24** is energized, simultaneously the third rail warning device illuminates and sends an auditory signal without prior warning to the high voltage energization.

FIGS. **3–5** show the warning device used in conjunction with the time delay relay alarm circuit (A) and a 125 VDC from the control panel **74** via the third rail **24**. The warning device has internal replaceable fuse **60** for protection in case that warning device is not removed prior to third rail **24** energization. The third rail **24** is to be tested prior to the warning device being connected to the third rail **24**. The third rail **24** must be tested and de-energized prior to connection of alarm device to third rail **24**. The work force is to be notified by railroad agency of time setting of the time delay relays **72** to allow removal of the warning device prior to the high voltage energization of the third rail **24**.

A 125 VDC source **54** has a negative lead **56** and a positive lead **58**. The positive lead **58** is connected to fuse **60**, an alarm bell **62**, and an alarm light **64**. The negative lead **56** is also connected to an alarm bell **62** and an alarm light **64**.

Referring now to FIG. **5** which is an electrical diagram of the warning control panel for sectionalizing switch. The time delay relay contact A **66** closes when the time delay relay **72** is energized, thus, sending 125 V D.C. to the third rail **24** and energizing alarm **78**. When predetermined time of TDR **72** elapses contact A **66** opens and contact B **68** closes, thus energizing gear motor **70** from 125 V D.C. switching source **54**.

Referring to FIG. **3**, which exhibits the alarm control panel for the warning signal prior to the breaker **82** closing and energizing the third rail **24**. When the time delay relay contact A **66** has closed and time delay relay contact B **68** has opened, at the moment that time delay relay contact A **66** close. 125 V D.C. is sent from the load side of breaker **76** to the alarm device **78** installed on the third rail **24** signalling the alarm device **78**. When the timer expires time delay relay contact A **66** open and time delay relay contact B close which sends 125 V D.C. to the breaker closing coil **82**, thus sending 625 V D.C. to third rail **24**.

The present invention is a modification of the existing 125 volts D.C. **74** control circuit used to activate the breaker closing coil **82** of a 625 volt D.C. Breaker is as follows. First the 125 volt D.C. **74** to closing coil **82** is re-routed through a time delay relay **72** with a double set of contacts, one normally open and one normally closed. The line side of these contacts are commonly fed with this 125 volt D.C. **74**.

The load side of contact a **66** are wired to the load side of the 625 volt D.C. Breaker **76**. The load side of contact B **68** are wired to the closing coil **82** of the 625 volt D.C. breaker. When the time delay relay **72** is energized the a contact close sending 125 volt D.C. through existing conductors and activating signal device **78**. Thus warning track personnel that third rail **24** energization with 625 volt D.C. is imminent. Simultaneously, the normally closed B **68** contact will open. The length of low voltage signal time to be determined

by railroad agency. Once timing sequence has ended contact a **66** opens eliminating warning voltage to third rail **24** and alarm device **78**. Simultaneously, the B contact **68** will close thus energizing closing coil **82** of the 625 volt D.C. Breaker, resulting in energization of third rail **24** with 625 volts D.C. This safety system may be adopted to any variety of existing track energization devices such as devices located in breaker houses and sectionalizer switches located on tracks or in sub stations.

Time delay relay **72** is energized closing A **66** contact and opening B **68** contact when A **66** contact close—send 125 V D.C. to alarm device **78** installed on track by work force. When the timer runs out A contact **66** open and B contact **68** close—sending 125 V D.C. **54** to closing coil **82** of breaker thus sending 625 V D.C. to third rail **24**. Time setting of the time delay relay are determined by the agency. Alarm device **78** is used in conjunction with time delay relay alarm circuit. 125 V D.C. **54** from A contact **66** in time delay relay of control panel **74** via third rail **24**. Alarm device **78** has an internal, replaceable fuse **60** link rated 130 V D.C. for protection in case device is not removed prior to track energization. Third rail **24** is be tested prior to alarm device being connected to rail. Third rail **24** must be de-energized prior to connection of alarm device **78** to rail.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the type described above.

While the invention has been illustrated and described as embodied in a third rail warning device, it is not intended to be limited to the details shown, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A third rail warning device comprising:

a. a third rail carrying when in use a dangerously high voltage;

b. means for connecting to said third rail a source of relatively safe voltage as a warning that said dangerously high voltage is about to be applied to said third rail;

c. time delay means to terminate said safe voltage and permit automatic connection of said high voltage to said third rail; and

d. alarm means connected to said third rail to issue a warning that said third rail is receiving said relatively safe voltage, thereby giving workers the time provided by said time delay means to remove themselves from harm's way.

* * * * *